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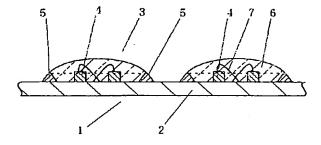
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# (54) 【発明の名称】 LED発光装置

### (57)【要約】

【目的】 指向性の向上と輝度増加を図ったLED発光 装置を提供する。

【構成】 表面が平坦な回路基板2の表面にLEDチッ プ4を配置するとともに、前記LEDチップ4を光透過 性樹脂6でモールドしたLED発光装置1において、前 記LEDチップ4を囲むように前記基板2の表面に前記 光透過性樹脂6と接触して厚膜の反射被膜5を形成し た。



# PATENT ABSTRACTS OF JAPAN

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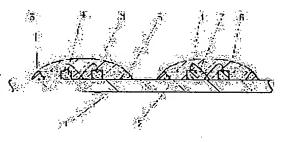
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# (54) LIGHT-EMITTING DEVICE

(57) Abstract:

PROBLEM TO BE SOLVED: To provide a lightemitting device for improving directivity and brightness.

SOLUTION: In a light-emitting device 1, where an LED chip 4 is arranged on the surface of a circuit substrate 2 whose surface is flat and at the same time, is molded by a light-transmitting resin 6, a thickfilm reflection covering 5 is formed in contact with the light-transmitting resin 6 on the surface of the substrate 2, so that the LED chip 4 is surrounded.



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### (57) Abstract

**Objects of the Invention**The LED luminescent device which aimed at directive improvement and the increase in luminosity is provided.

**Elements of the Invention**In the LED luminescent device 1 which carried out the mold of said LED tip 4 by the light transmittance state resin 6, while the surface had arranged LED tip 4 on the surface of the flat circuit board 2, said light transmittance state resin 6 was contacted, and

the reflective tunic 5 of a thick film was formed in the surface of said substrate 2 so that said LED tip 4 might be surrounded.

### Claim(s)

**Claim 1**In an LED luminescent device which carried out the mold of said LED tip by light transmittance state resin while the surface had arranged a LED tip on the surface of the flat circuit board, An LED luminescent device having contacted said light transmittance state resin and forming a reflective tunic of a thick film in the surface of said substrate so that said LED tip may be surrounded.

**Claim 2**The LED luminescent device according to claim 1 making thickness of said reflective tunic thicker than one third of height of said LED tip.

**Claim 3**The LED luminescent device according to claim 1, wherein said circuit board is board thickness comparable as height of said LED tip.

**Claim 4**The LED luminescent device according to claim 1, wherein said circuit board is board thickness thinner than height of said LED tip.

# Detailed Description of the Invention

**Field of the Invention**This invention arranges a LED tip on the circuit board, and relates to the LED luminescent device which carried out the resin molding. **0002** 

**Description of the Prior Art**The LED display device of the structure which arranges a LED tip directly and carries out a resin molding on the circuit board as a dot-matrix type LED display device which displays a character and a figure is proposed (for example, JP,9-6259,A). Although this LED tip direct attachment type of display for indication could attain slimming down and a weight saving, since it is the structure where an angle of visibility is large, light tended to be distributed by the whole, and it was not able to attain a rise in luminosity. Then, in order to attain the rise in luminosity which can be equivalent also to use on the outdoors, using as a reflector the electrode etc. which formed the hollow in the circuit board and were formed in this hollow, and raising that luminosity with the directive improvement to a front direction is proposed (for example, refer to Japanese Patent Application No. No. 17303 **11 to**). **0003**However, when the circuit board is thick, the above hollows can be formed, but it is

becoming difficult to form the above hollows as the thickness of the circuit board becomes thin. Even if the circuit board has sufficient thickness to form a hollow, forming a hollow in the circuit board or forming a circuit pattern in the hollow has the technical problem that complication of a manufacturing process, the increase in a process of operation, etc. are caused.

### 0004

**Problem(s) to be Solved by the Invention**This invention makes it a technical problem to provide the LED luminescent device which aimed at directive improvement and the increase in luminosity. Let it be a technical problem to attain simplification of the manufacturing process of an LED luminescent device.

# 0005

Means for Solving the ProblemLike a statement to claim 1, while the surface arranges a LED tip on the surface of the flat circuit board, an LED luminescent device of this invention, In an LED luminescent device which carried out the mold of said LED tip by light transmittance state resin, said light transmittance state resin was contacted and a reflective tunic of a thick film was formed in the surface of said substrate so that said LED tip might be surrounded.

**0006**An LED luminescent device of this invention is characterized by the thing **having made thickness of said reflective tunic thicker than one third of height of said LED tip like** according to claim 2.

**0007**An LED luminescent device of this invention is characterized by the thing **that said circuit board is board thickness comparable as height of said LED tip like** according to claim 3.

**0008**An LED luminescent device of this invention is characterized by the thing **that said circuit board is board thickness thinner than height of said LED tip like** according to claim 4.

#### 0009

Embodiment of the InventionThe example of this invention is described with reference to drawings taking the case of a dot-matrix type LED luminescent device below. As shown in drawing 3, as for the LED luminescent device 1, a length of one side arranges the display dot 3 2-3 mm in diameter to the matrix form of 16x16 in the pitch of around 3-4 mm on the surface of the several around centimeters circuit board 2.

**0010**The circuit board 2 comprises a printed circuit board which consists of glass epoxy etc., and the wrap resist tunic (neither is illustrated) is formed in the surface in the circuit pattern and it which consist of copper foil etc. And since the thickness of a wrap resist tunic is very thin in a circuit pattern or it, the surface of the circuit board 2 is flat. The board thickness of the circuit board 2 is thickness equivalent to the height of the LED tip later mentioned at around 0.3 mm. Therefore, it becomes difficult to form the hollow of the depth to which a LED tip is buried with this circuit board 2.

**0011**The display dot 3 is provided with the resin 6 of a wrap light transmittance state, and constitutes LED tip 4 as a light emitting device fixed on the circuit board 2 as shown in drawing 1, the reflective tunic 5 arranged on the circuit board 2 so that the circumference of this chip 4 may be surrounded annularly, and LED tip 4.

**0012**A length of one side is an around 0.3-mm rectangular parallelepiped, LED tip 4 is fixed to the surface of the circuit board 2 by electroconductive glue, such as silver paste and solder, and wiring is given to the pattern on the circuit board 2 using the wire bond line 7 which consists of gold etc. LED tip 4 as a light emitting device can be constituted or more from one, and can also consist of two or more chips from which a color is different if needed.

**0013**Since light reflex nature is constituted by the thick film using a good tunic, for example, white resin, and reflects the light of LED tip 4 in the normal line direction of the circuit board 2 efficiently, the reflective tunic 5 is provided with the reflector with the angle of about 45 degrees. The height of the reflective tunic 5 is set as the same grade as the height measurement of said LED tip 4. Problems, like if the height measurement of the reflective tunic 5 is too low, the light reflection efficiency of LED tip 4 will worsen, and if height measurement is too high conversely, will interfere with the processing at the time of forming said light transmittance state resin 6, or it becomes difficult to arrange to the limited field between LED tips 4 arise. Therefore, as for the height measurement of the reflective tunic 5, it is preferred to make it fit in 1 / twice **three to** (100 micrometers - 600 micrometers) as many range as this of the height measurement of LED tip 4, and it is most preferred to set up fit in the range of the upper bed position of the wire bond line 7 from the upper bed position of LED tip 4.

**0014**The resin 6 of a light transmittance state comprises resin of an epoxy system in which the light diffusion agent of the silica particle was mixed, and after having been arranged to the field surrounded by said reflective tunic 5, it heat-hardens.

**0015**Next, the manufacture procedure of this LED luminescent device 1 is explained with reference to drawing 2. As shown in the introduction said figure (A), a circuit pattern and resist prepare the circuit board 2 formed beforehand. Next, as shown in the figure (B), on this circuit board 2, the chip bond of LED tip 4 is carried out, it fixes, and wiring by the wire bond line 7 is performed after that.

**0016**Next, as shown in the figure (C), the reflective tunic 5 is formed on the circuit board 2. The reflective tunic 5 applies epoxy system resin of a white system which raised viscosity, for example on the circuit board 2 in the state of a thick film with techniques, such as screenstencil. Immediately after spreading, with own mobility, the sectional shape is changed and a section changes rectangular resin a section triangle thru/or in the shape of a circle. In order to improve these since the range of the reflective tunic 5 may expand too much if circular when neither sufficient degree of angle of reflection nor a reflector product is chosen or, heat curing of resin is performed carrying out flip vertical of the circuit board 2, and holding it. By reversing and holding the circuit board 2, the sectional shape of resin is formed in an approximately triangle, and breadth prevention of improvement in a reflection property and own foot can be aimed at.

**0017**Next, the light transmittance state resin 6 is formed in the same procedure as formation of the reflective tunic 5. That is, the transparent epoxy system resin which raised viscosity is applied inside the reflective tunic 5 on the circuit board 2 in the state of a thick film with techniques, such as screen-stencil. Immediately after spreading, with own mobility, the sectional shape is changed and a section changes rectangular resin to an arc shaped cross section. It is in the state, or where flip vertical of the circuit board 2 is carried out, heat curing of resin is performed, and the resin 6 of convex lens shape is formed.

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\*\* \*\* \*\*\*

0018The LED luminescent device 1 as shown in drawing 1 and drawing 3 through such a process can be manufactured. If the LED luminescent device 1 constituted in this way makes LED tip 4 turn on, a part of light to which he comes out of the chip 4, and follows the inside of the light transmittance state resin 6 will reach the reflective tunic 5, and it will be reflected in the normal line direction of the circuit board 2 in the reflector of the reflective tunic 5 inside. Therefore, while improving the directivity of the light which comes out of LED tip 4, the luminosity of the front direction of the LED luminescent device 1 can be increased. Here, although it is also considered as the reflective tunic 5 that compatibility with the resin 6 uses oil-repellent high resin, such as a bad material, for example, silicon etc., in this case, the resin 6 is crawled by the reflective tunic 5, both will be in a non-contact state and there is a possibility that the reflex function of the reflective tunic 5 cannot be exhibited. However, since a good material of compatibility constitutes from this example mutually by using the reflective tunic 5 and the light transmittance state resin 6 as resin of the same kind, It can maintain at the state where the light transmittance state resin 6 was contacted to the near-full area of the reflector inside the reflective tunic 5, and the light passing through the inside of the resin 6 can be effectively reflected by the tunic 5.

**0019**Although what has the thickness of the same grade as the height measurement of a LED tip was used for the above-mentioned example as the circuit board 2, this invention is useful when using the circuit board 20 whose thickness is thinner than the height measurement of LED tip 4, as shown in drawing 4. For example, it is useful, when a base film is equipped with a circuit pattern or it for wrap thin film resist etc. and thickness uses the flexible circuit board 20 with a film state of around 100 micrometers as the circuit board. This invention is useful also when using the circuit board whose thickness is thicker than the height measurement of LED tip 4 as the circuit board 2.

**0020**Although the above-mentioned example showed the example to which only a field is touched and while functioning on the peripheral part of the resin 6 as a reflector of the reflective tunic 5 arranges the field of another side besides the resin 6, as shown in drawing 5, as the reflective tunic 5 is embedded thoroughly at the peripheral part of the resin 6, it can also arrange it.

**0021**This invention is not restricted to a dot-matrix type LED luminescent device, and can also apply a linear light source, the source of sheet-like light, etc. to other LED luminescent devices provided with the light transmittance state resin which carries out the mold of a LED tip and it to the circuit board.

### 0022

**Effect of the Invention**According to this invention, assembly work nature can provide a good LED luminescent device as mentioned above with a thin shape which aimed at directive improvement and the increase in luminosity.

## **Brief Description of the Drawings**

Drawing 1It is an important section sectional view of one example of this invention.

**Drawing 2**It is a sectional view showing the manufacturing process of one example of this invention.

**Drawing 3**It is a top view of one example of this invention.

Drawing 4It is an important section sectional view showing other examples of this invention.

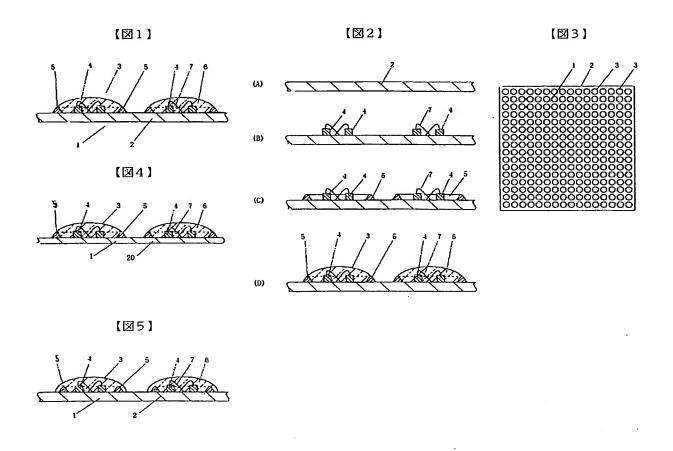
**Drawing 5**It is an important section sectional view showing other examples of this invention.

# **Description of Notations**

- 1 LED luminescent device
- 2 Circuit board
- 3 Display dot
- 4 LED tip
- 5 Reflective tunic
- 6 Light transmittance state resin

### Drawing 1

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